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ABSTRACT

This document reports on a workshop held January 4-5, 1996. Participants of this conference represented the areas of science, mathematics, engineering, and technology (SMET) education and attempted to develop questions regarding systemic education reform. Contents include: (1) "Introduction"; (2) "Evaluation Questions Conference"; and (3) "Next Steps." Appendices include: (1) "Conference Participants"; (2) "Invitees Unable to Attend"; (3) "Meeting Agenda"; (4) "Small Group Assignments"; (5) "Criteria for Questions"; (6) "Meeting Evaluation Responses"; and (7) "Pre-Conference Discussion Papers." (YDS)

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Workshop Report No. 2

Evaluation Strategies Project: A Report of the Evaluation Questions Conference of the Evaluation Strategies Project Held January 4-5, 1996, Madison, WI

Norman L. Webb and Daniel J. Heck

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National Institute for Science Education (NISE) Publications

The NISE issues papers to facilitate the exchange of ideas among the research and development community in science, mathematics, engineering, and technology (SMET) education and leading reformers of SMET education as found in schools, universities, and professional organizations across the country. The NISE Occasional Papers provide comment and analysis on current issues in SMET education including SMET innovations and practices. The papers in the NISE Research Monograph series report findings of original research. The NISE Conference and Workshop Reports result from conferences, forums, and workshops sponsored by the NISE. In addition to these three publication series, the NISE publishes Briefs on a variety of SMET issues.

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Norman L. Webb and Daniel J. Heck

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Norman Lott Webb is a senior research scientist for the Wisconsin Center for Education Research at the University of Wisconsin-Madison. He directs evaluations of curriculum and professional development projects. Currently he is leading the Strategies for Evaluating Systemic Reform Project for the National Institute for Science Education, a cooperative agreement between the National Science Foundation and the Wisconsin Center for Education Research. He is directing the evaluation of the Interactive Mathematics Program and the Park City/IAS Mathematics Institutes and is serving as a consultant on the National Evaluation of Library Power project. Some of the recent projects he has directed include the *Wisconsin Performance Assessment Development Project*, funded by the Wisconsin Department of Public Instruction, and the mathematics case studies for the Case Studies of United States Innovations in Mathematics and Science and Technology Education in an International Context Project. His work with NCTM has included consulting with the Assessment Standards writing group. He chaired the evaluation working group, one of four groups who wrote the Curriculum and Evaluation Standards for School Mathematics. He edited the NCTM 1993 yearbook on classroom assessment. A book he edited with Tom Romberg on the Urban Mathematics Collaborative Project was published in 1994. He has worked on or directed evaluations on a number of projects including the Woodrow Wilson National Fellowship Foundation Leadership One-week Summer Institutes. He has had the privilege to present lectures and seminars to a number of groups in the United States and in other places in the world including Oman, Iceland and Spain. He is a member of different groups working toward change in assessment and chairs the advisory board for the *Assessment in Practice* newsletter produced by MSEB. His current views on assessment are best reflected in "Assessment of Students' Knowledge of Mathematics: Steps Toward a Theory," a chapter in the *Handbook of Research on Mathematics Teaching and Learning*.

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Executive Summary

The Evaluation Questions Conference, held in Madison, WI January 4-5, 1996, was attended by 26 participants representing a wide range of involvement in science, mathematics, engineering, and technology (SMET) education and practice. The purpose of the conference was to develop a set of questions for and about evaluations of systemic education reform (SER).

Four discussion papers, authored by conference participants, were distributed prior to the conference. Each paper enumerated a list of questions for and about an evaluation of SER centering on a particular area of systemic reform. The areas covered were student outcomes in science and mathematics, system alignment and system change, and the community college.

Following brief presentations on the four discussion papers, conference participants were divided into four groups for the task of further defining and refining questions for and about evaluations of SER. The four small working groups of 7-8 participants met for three extended periods over the two days of the meeting. Each group approached the task differently, but each group produced a useful, refined set of questions by the end of meeting. Furthermore, the groups variously produced useful definitions of systemic reform, raised issues about the design of evaluations of SER, and identified areas still in need of evaluation questions.

The questions produced by the meeting can be roughly classified in the following categories:

A. Questions about an evaluation of SER
   1. about evaluation design
   2. about uses of evaluation
   3. about who is involved in evaluation

B. Questions for an evaluation SER
   1. about the nature of the reform effort—its durability, flexibility, coherence, and systemic nature
   2. about involvement in the design and implementation of the reform
   3. about incentives for participation in the reform
   4. about the vision of the reform
   5. about resources for the reform
   6. about the design of communication within the reform
   7. about the patterns of communication within the reform
   8. about changes in expectations
   9. about student performance outcomes
   10. about equity
   11. about long-term outcomes (e.g. employment)
   12. about changes in classroom processes
   13. about professional development of teachers

A number of next steps in the process of designing an evaluation of SER were advanced. Refinement of the questions into a hierarchical structure was suggested. Several different recommendations were made about how the questions could be used to begin thinking about evaluation designs and related issues. Also, some participants advanced ideas about how hypothetical or experimental evaluations could be conducted to examine the questions in a realistic context.

Introduction

A large effort has been mounted by National Science Foundation and others to support systemic education reform at the state, regional, and district levels. The size and complexity of systemic reform creates an enormous challenge for developing evaluations that truly represent what are outcomes attributable to systemic education reform and can produce useful information for making decisions for advancing reform. A number of evaluation efforts currently in place are designed to respond to particular needs, i.e. external and internal evaluations of state systemic initiatives and evaluations of the total systemic initiative program.

The Evaluation Strategies Project of the National Institute for Science Education is devoted towards studying evaluation of systemic education reform. The ES Project, composed of 13 members representing a range of disciplines and roles, is one of six projects of the National Institute for Science Education (NISE).

One main goal for the ES Project is to design models that can be used to evaluate systemic education reform. As an initial step in the design process, the project set for its first year, 1995-96, the object of identifying what are important questions to be asked for and about an evaluation of systemic education reform. These questions then will be used to develop models, designs, and strategies for judging the value of systemic education reform.

Over the period from June through December, the ES Project had met three times to begin the work of studying the evaluation of systemic education reform. These meetings were spent establishing some common understanding among the project members of what is systemic reform and what is important for studying the evaluation of systemic reform.

The purpose of the January 4-5, 1996, conference was to continue the process of identifying and refining questions critical for developing models for evaluation. Participants in the working conference received four discussion papers in advance of the conference. Authors of these papers were asked to write a 20 to 30 page (double space) paper to generate discussion leading toward the identification of questions related to a vital area for evaluating systemic reform in science, mathematics, engineering, and technology. Papers were written on student outcomes in general (Burkhardt and Ridgway), student outcomes in science (Comfort), system alignment (Ridgway and Burkhardt), and community college issues (Jackman). Authors were asked to present questions, relevant to an assigned topic, for and about an evaluation of systemic reform and a rationale for the inclusion of each question within a coherent and informed framework of evaluation and systemic reform.

Only a few people were invited to attend the conference in order to keep the number small enough for productive discussion. The invitees were chosen based on their discipline and the role they were assuming in order to have a range of stakeholders for an education system. These included classroom teachers, community college administrators, university professors, mathematicians, scientists, engineers, evaluators, and policy makers. Not all of the people could attend the conference, so not all categories were represented. Those who did attend were grouped into four small groups of six or seven members. The work of these small groups comprised the major accomplishment of the conference and is reported in these conference proceedings. The four discussion papers are included in the appendices.

What is presented in this report is work in progress. The questions generated by the small groups, the discussion papers, and the issues raised in plenary sessions will be refined further. Questions will be aggregated and analyzed with respect to current literature and based on existing knowledge and

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experiences in doing evaluation of large systems. They will be used to design practical evaluation models.

Evaluation Strategies Project:
A Report of the Evaluation Questions Conference of the
Evaluation Strategies Project held January 4-5, 1996, Madison, WI

Norman L. Webb and Daniel J. Heck

On January 4-5, 1996 the Evaluation Strategies Project of the National Institute for Science Education (NISE) held a conference in Madison, Wisconsin. The purpose of the conference was to define a set of questions for and about an evaluation of systemic education reform (SER). Participants in the conference included members of the Evaluation Strategies Project; elementary, secondary, and post-secondary (community college, university) educators; scientists; engineers; and education researchers and evaluators.[1]

Sessions of the conference were divided between plenary presentations and discussions and small group working sessions. The purposes of the plenary sessions were to introduce information and procedures to participants, to discuss issues pertinent to the work of all small groups, to provide opportunities for reporting of information and ideas from small groups, and to allow opportunities for feedback to small groups. The purpose of the small group sessions was to develop and refine sets of questions for and about an evaluation of SER. All sessions of the institute were facilitated by personnel from the Office of Quality Improvement at the University of Wisconsin-Madison. All sessions were also recorded on audio and/or video tape, and by note-takers using lap-top computers. Recording of the sessions was employed for the purpose of research and evaluation on interdisciplinary collaboration in the NISE[2], and for the purpose of keeping an accurate record of the conference for the Evaluation Strategies Project.

Four thought papers were prepared and distributed in advance of the conference. Each paper introduced a set of questions for and about an evaluation of systemic reform focused on a particular topic. The papers included: "Student Outcomes in Evaluating Systemic Change," a paper focused on student outcomes in mathematics, by Hugh Burkhardt and Jim Ridgway; "Student Outcomes in Science" by Kathy Comfort; "System Alignment and System Change" by Jim Ridgway and Hugh Burkhardt; and "Assessment and Educational Reform: Doing More than Polishing Brass on the Titanic, a Call for Discussion" by Andrew Jackman. The papers were intended to produce some advance thinking about questions for and about an evaluation of SER. Neither the range of topics addressed, nor the sets of questions introduced, were intended to be exhaustive. The packet of distributed papers also included a brief introduction by Norman Webb, team leader of the NISE Evaluation Strategies Project, that presented a basic outline of SER from Smith & O'Day (1991); three key components of the education system that should be considered in any evaluation, namely need, performance, and capacity; and some guidelines for forming evaluation questions.

Plenary Sessions

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[1] Representatives of the National Science Foundation, a partner in the NISE, were unable to attend due to a federal budget impasse and the concurrent closing of federal agencies.

[2] Sharon J. Derry, professor of educational psychology, University of Wisconsin-Madison, is leading the Micro-Evaluation component of the NISE.

Plenary Session 1

During the opening session of the Evaluation Questions conference, Norman Webb, Denice Denton, and Sharon Derry introduced participants to the NISE and several of its component programs, in particular the Evaluation Strategies Project and the Micro-evaluation component. Norman Webb presented the purpose of the conference—to define and refine a set of questions for and about an evaluation of SER—and the expectations for products to be yielded—three to four high quality questions for and about evaluation of SER from each of four small groups.

Kathleen Paris, a meeting facilitator from the Office of Quality Improvement, discussed the agenda and procedures for the meeting. She also led the group in introductions and solicited participant expectations for the conference.

The authors of the four thought papers included in pre-conference materials, then, each were given ten minutes to highlight the framework guiding the development of questions and the most important questions in their respective papers[3]. The presentations were intended to stimulate participants' thinking about the questions proposed in the papers and to serve as a foundation for further creation of questions for and about an evaluation of SER.

Plenary Session 2

To begin the second day of the Evaluation Questions conference participants met in a plenary session to reflect on the thinking and products of the first day in preparation for further defining and refining questions for and about an evaluation of SER. Following a brief introduction to the agenda for day two, each small group met in a huddle for a few minutes to identify two questions about which the group desired to receive feedback from other participants. The current set of existing questions from each group was distributed to all participants for reference.

Each group chairperson presented his or her group's two identified questions to the total group of participants for feedback. The group's discussions focused mainly on clarifying precisely why each question is important for or about an evaluation of SER. Most suggestions that were offered centered on how questions could be refined to reflect their specific importance to an evaluation. Some other issues that were discussed during the session included the variables inherent in questions, potential measures and indicators appropriate for variables, and the establishment of causal relationships between reform efforts and measured outcomes.

[3] Kathy Comfort, the author of "Student Outcomes in Science" was not present at the conference. Norman Webb spoke on her behalf.

Plenary Session 3

A general discussion was conducted on what people saw as issues in evaluating systemic reform. A number of issues were raised. One set of issues raised was related to the nature of systemic reform and what could be included as systemic reform. One recommendation was to look at systemic reform beyond the current models being employed by the state systemic initiatives. These existing models may be too limiting. Systemic reform is contextual. In considering systemic reform, it needs to be done in the context of the society and communities being served. A related issue is the beliefs and values held by those engaged in reform and those within the system being reformed. What beliefs these people have of the world and what they believe can be done about changing the world are critical to understanding systemic reform.

Another issue discussed in some length was the black box issue. Some people felt that understanding and being able to describe how systemic reform worked was essential to evaluating the outcomes of systemic reform. Others felt that the effectiveness of systemic reform could be judged in relation to expectations without fully knowing how the system worked. One person described systemic reform as applied theory. A state systemic initiative is really someone's theory about change being put into practice. As a theory, what is being done can be described as a set of if-then statements. The challenge for evaluation is to look for educational effects that can be attributed to reform initiatives. This was related to a previous discussion of using causal models and looking for causes and effects. Of course, any theory would have to be robust enough to incorporate that different levels within the system will respond to different pressures and act in different ways. Not all agree with reform as applied theory. One felt that systemic reform reflected more certain assumptions than theory. A maxim was offered by one member at the close of the session, "Change should not be left to experts."

Small Group Sessions

Each of four small groups consisting of six to seven participants was charged with the task of defining and refining a set of questions for and about an evaluation of SER. Membership in the small groups remained consistent throughout the conference. One participant was appointed chairperson of each group. Each group also had a facilitator and a recorder present.

Suggested guidelines for procedure were given to each small group. Each group followed some of the guidelines and determined some of its own procedures. The activities and products of the four small groups are described below.

Group 1

Small group 1 set some basic ground rules to govern group procedures, but quickly moved on to developing a common definition of systemic education reform. The definition to which the group members agreed was:

> Systemic Reform is:
> Large-scale, long term change intended to raise expectations for and improve [student, teacher] performance [knowledge and application] in science, math, engineering and technology [SMET], to enable all people to participate in a democratic society.

Once a basic definition had been established the group orally brainstormed a set of statements regarding what characterizes SER, or what SER requires. The following list of ideas was generated:

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Systemic Reform Requires:
Change in expectations
Change in epistemology (what it means to "know", memorizing facts not enough)
Mobilizing all potential allies (national, state, local)
Mobilization and leveraging of resources in a focused direction
Producing a system that's adaptable as needs change (e.g. Republican budget response)
Participation of everybody, not just targeted groups
Incentive for teachers to put forth effort to change
Agreement on what the change will be -- vision must be crystallized so people can buy into it (not change for change's sake)
That resources, finances, rules, regulations not be the dictator of change
There's a plan first, then finances should be sought
Recipients of products sit on advisory committee and participate in evaluation (citizens, parents, employers, other educational levels)
Clarity in who makes what decisions
Community support based on involvement in the program
That public expectations and change proceed at a similar rate
Communication throughout the system to ensure working toward same goals
Decisions made on what students need to be adults now, but what about their needs as adults of the future
Analysis of system that underlies education (class times, etc.) accepts nothing as a given
Use of research on learning to formulate most appropriate and challenging activities for each student

Later the group brainstormed a similar set of ideas about the characteristics or requirements of an evaluation of SER. The list follows:

Characteristics of good evaluation of systemic reform:
Problem can be backlash if first contact with stakeholders is through evaluation results
Supports, strengthens change process
Documentation is valid and reliable
Evidence is used to make judgments
Data used to inform decisions
Evaluation criteria and processes are established at the beginning of the SER and communicated to intended beneficiaries
Question of priorities and resource allocation considered in evaluation design

Group members voted to determine what were the most important of the brainstormed ideas using a voting procedure that was limited (each group member had seven votes to use) and weighted (each group member could use up to three votes on any one item). Some consensus was reached regarding which of the ideas were most important to SER and its evaluation. Those ideas became categories in which the group developed questions for and about an evaluation of SER.

1) Epistemology: Some questions should be able to be asked to multiple audiences.
   A) What indications are there that [teachers', students'] performance in (building connections, extending ideas to new situations, explaining why and how to others, etc...) has increased?

B) What evidence is there that teachers are able to help students learn to build connections, extend ideas to new situations, explain how and why to others?
C) What indications are there that public expectations have changed in terms of increased ability to build connections, extend ideas to other areas, explain how and why to others?
D) What efforts have been made to initiate dialogue and explain the need for increased abilities in A, B, C to teachers, parents, community members and all audiences?
E) [how to form a question about "owning" knowledge?]

2) Resources:
A) What changes have occurred as a result of the reform with respect to resource allocation, mobilization, and mechanisms by which decisions are made relative to resources?
B) In what ways have other funding sources been focused on the SER? (Eisenhower, Industrial grants, textbook fund)
C) How does the budget process support the SER?
D) How have budgeting processes changed since instituting SER?

3) Vision:
A) What evidence is there that there is a feeling of dissatisfaction with the status quo and a commitment to some common vision?
B) To what extent do teachers, students, parents, and community members agree on the vision?
C) Is there a common vision guiding resource allocation?

4) Involvement of all intended beneficiaries (students, educators, businesses, community):
A) To what extent are intended beneficiaries involved in program design, implementation, evaluation, and decisions that affect them?
B) What changes have occurred in who is involved in SMET education and practice? (e.g. course-taking patterns of students, involvement of businesses in classrooms, employment, etc.)
C) Is the reform effort designed, implemented and evaluated in terms of all students, not just one group such as college-bound students?

5) Incentives:
A) What incentives are there for teachers to put forth the effort to create and implement the reform program?
B) How meaningful are incentives considered by teachers themselves?
C) What incentives are there for community members, businesses to put forth the effort and resources to support the reform effort?

6) Communication:
A) How have communication patterns and processes changed in the system as a result of the SER?
- How has the reform process affected changes in communication among parents, administrators, teachers...?
B) What audiences are specifically designated to receive information?
C) What evidence is there that there has been communication with these audiences?
D) To what extent are a variety of communication tools used to ensure that information is adequately disseminated?

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E) Can the extent to which two-way communication flows within the system as a whole be documented graphically? (Communication maps)
F) How do the patterns and content of communication within the system demonstrate commitment to participation in efforts toward common goals?
G) To what degree is the decision-making process transparent to all players?

7) Redesign of education—nothing as a given:
A) To what extent do key players continually reconsider the system in light of its continually emerging goals?
B) What evidence is there that historical elements of education (schedules, traditions, class divisions) have been thoughtfully and seriously challenged in the process of developing the SER vision?

8) Flexibility:
A) To what extent is the system sufficiently flexible to take advantage of strategic opportunities?
B) To what extent does the system remain comprehensible to its beneficiaries over time?
C) Is there institutional flexibility to allow students to pursue their own intellectual goals?

9) Questions about evaluation:
A) What kinds of public reactions to the evaluation data are expected?
B) What capacity does the system have to respond to public reactions to disclosure of evaluative data, anticipated and unanticipated?
C) To what extent does the evaluation support and strengthen the change process?
D) Is documentation trustworthy? (has reliability, validity, generalizability, and sensibility)
E) To what extent are data really used to inform decision making?
F) Is the process of gathering and interpreting data open and accessible to the intended beneficiaries?
G) Are the criteria and processes of gathering and interpreting data identified at the beginning of the SER?
H) To what extent are beneficiaries involved in evaluation design and implementation?
I) What measures have been taken to ensure intellectual sovereignty of evaluators? (i.e. freedom from political pressures, negative consequences)
J) Are the available resources commensurately appropriate to the evaluation design? (neither too much nor too little)

Group 2

Small group 2 avoided setting any ground rules for group proceedings, but instead determined a set of criteria for their questions and the task of creating questions. Their criteria were:

Criteria:
1) Be as student centered as possible for all stakeholders/clients
2) Focus on science, math, engineering, and technology [SMET]
3) Functionality and sustainability

The group was then given over to silent, individual reflection and brainstorming on the question "What questions should we ask to determine merit and worth of systemic educational reform efforts?" Group members then read the questions they had written in order to produce a list of questions to use as a

foundation for further discussion. The questions the group members individually produced and presented were:

1) What's the impact of reforms on student learning?
2) Which clients know about and understand the reforms?
3) What role do teachers play in the design and implementation and how has their classroom practice changed?
4) How do we know what students are learning what we decide to deliver?
5) How do we ascertain what academic rigor is maintained in the reform process?
6) Does the reform initiative equip students to tell whether or not the learning experiences are being superbly delivered? I want students to be part of the evaluation process.
7) How do we evaluate for the connectedness with societal expectations?
8) What do we think is systemic education reform?
9) How do local, state, and federal agencies interact and share responsibilities for systemic education reform? How has the reform effort coordinated local, state, and federal agencies to encourage interactivity and sharing?
10) How will the idea of the state departments of education role change and by what authority?
11) To what extent and how should systemic reform concern itself with family and local cultures as they are correlates to school success?
12) Are the evaluators stakeholders or [unbiased] servants?
13) How are student outcomes defined and characterized?
14) What are the effects of the evaluation process on the system?
15) What is the relation of instructional processes to student outcomes?
16) Have students reached the reform goals?
    - Do students believe that they understand the world?
    - Can they show understanding with an example?
    - Can they apply this understanding across different contexts?
    - Do they recognize the relationships between formal mathematics and everyday applications?
17) Are teachers implementing reform effectively?
    - Are students and teachers active participants?
    - Do teachers have insights into the subject matter?
    - Do teachers believe their students are capable of the goals?
    - Do they have pathways to those goals?
    - Do they have assessment strategies to know progress toward goals?
18) How can we maintain sensitivity to issues of gender and race with regard to SMET during periods of educational reform?
19) Will students and other stakeholders support educational reform efforts?
20) What role will students have in helping to define the various standards for educational reform?
21) Does the system have a formative and summative assessment procedure that involves an informed group of stakeholders and allows them to discover whether the students are proceeding toward the goals and the teachers are involved in the reform process?
22) When is the right time to do an evaluation of a system?

Next, the group worked on categorizing questions, and discussing which questions were most appropriate for formative or summative purposes. The group also identified the most critical questions versus those that they perceived as tangential questions. Some existing questions were consolidated. The categorization of questions by content included:

Student Learning: 1, 4, 13, 16
Teachers: 3, 17, 6
Curriculum: 5
Partnerships: 2, 7, 19, 21, 9, 10, 20

Within these categories the group determined that there should be a few major questions and sets of sub-questions. The group divided into two sub-groups to work on the major questions in two categories—student learning and teachers.

The group rejoined and listed the questions that each sub-group had developed. These questions drove further discussion and refinement. An important assumption the group made was that the evaluation questions should help drive the reform effort. The group's final set of questions was:

1) How effectively has the school/classroom become a community of engaged learners and teachers that is academically rigorous? And how effectively does it provide equal access to learning experiences for all students?
   A) What is the nature of student-student, teacher-student, and teacher-teacher interaction?
   B) What are the expectations for teacher knowledge and understanding?
   C) What are the teachers' expectations for student learning?
   D) What support is available for teacher professional development?
      1) Resources
      2) Reorganization of work day
      3) Role of teachers in defining vision for implementation of SER
      4) Response of teachers to 1 - 3.
   E) Role of students in defining vision for implementation of SER

2) What are students learning in terms of the following goals:
   · factual knowledge
   · thinking and problem solving skills
   · critical thinking
   · ability to use that knowledge for problem solving
   · ability to communicate understanding to others
   · understanding concepts
   · belief that they can understand the world
   · sense of ownership of material
   · systemic skills (how to survive system; how to flourish in the system)
   · technical skills
   A) What percent of students are attaining benchmarks?
   B) How is performance changing with respect to these goals?
   C) Include characterization of performance of different demographic groups.

3) To what extent has the system implemented a formative and summative evaluation procedure that involves an informal group of stakeholders (i.e. students, faculty, administrators, parents, community members, employers, workforce) allowing them to discover whether the students are proceeding towards the reform goals, the teachers are involved in the reform process, and the administration is supportive of the reform efforts?

4) To what extent does the system provide opportunities for active participation of all its constituents in the decision making process?

· What mechanisms are in place to educate stakeholders (*) and facilitate the implementation of reform? (* parents, legislators, labor unions, ...)

Group 3

Small group 3 adopted the ground rules that they saw applied during the preceding plenary sessions. The group was then given over to individual brainstorming on their questions for and about an evaluation of SER. Following the brainstorming session, each member reported two questions to the group. The questions offered were:

1) How do you establish the causal connection between reform action and student outcomes?
2) What are the effects of systemic reform on:
    A) Achievement in math and science;
    B) Attitudes toward math and science;
    C) Persistence in the study of math and science;
    D) Employment in the fields of math and science?
3) What research/evaluation design would allow us to evaluate the system reform effort?
4) How can we devise an assessment of change in teacher pedagogy in math and science over K-16?
5) What evidence is there of any (desirable) change at the classroom level?
6) Is there a strong likelihood that students enrollment in advanced science courses has increased because of SER?
7) What are the distributions of efforts across:
    A) Types of students;
    B) Geographic locations;
    C) Time;
    D) Levels of Education;
    E) Areas of Math and Science?
8) What specific instruments and other forms of evidence do we use to measure these effects, and how do these selections reflect the perspectives of various stakeholders?
9) How can we measure changes in assessment (formative and contextual) for K-16 to bring about:
    A) Teachers as researchers into their own effectiveness;
    B) Influence on pedagogy and curriculum integration in the system for the world of work or further education so that students become contributors, problem solvers, critical thinkers, and collaborators?
10) What tasks have students gotten better and worse at?
11) Is there any medium for the long range tracking of outcome variation?

From this list of questions the group spent some time discussing at what levels of education each question could be appropriately asked and answered. Indicators that would help evaluators answer each question were also discussed. Moreover, the group considered extensively the evaluators' task of establishing causal relationships of outcomes due to the reform.

Through discussion, the group categorized similar questions. The group paid special attention to questions about outcomes versus ques ions about processes. Some new questions were added, existing questions were combined, and some questions were further refined with sets of sub-questions. During this process the group determined the need for a working definition of SER. The group discussed and

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critiqued the criteria defined by Smith & O'Day (1991), but did not determine a specific definition of its own.

After refinement of questions, the group members voted (limited, weighted voting) on which questions they viewed as most important for and about an evaluation of SER. Those questions identified as most important were further refined through attention to considerations of design, causality, hypothesis testing, data types and sources, "value-added" considerations, cost and allocation of resources, and critical variables and indicators. The final set of questions the group produced was:

1) What research/evaluation design would allow us to:
   - A) Distinguish effect due to SER from other possible causes?
   - B) Search for and disseminate evidence of both positive and negative efforts?
   - C) Establish the causal connection between specific reform actions and outcomes?
   - D) Identify inconsistencies in the SER plan as it unfolds?

2) What are the effects of systemic reform on:
   - A) Classroom practices?
     - i.e. (1) assessment practices
       - (2) pedagogy
       - (3) integration of curriculum
   - B) Achievement in math and science?
   - C) Attitudes toward math and science?
   - D) Persistence in the study of math and science?
   - E) Employment in the fields of math and science?

A)-E) in each of the following contexts:
   - i) Types of students (race, income, gender, etc.)?
   - ii) Geographic locations?
   - iii) Time ?
   - iv) Levels of Education?
   - v) Areas of Math and Science?

3) What evidence is there of any desirable change at the classroom level?
   - i.e. A) Assessment practices
     - B) Pedagogy
     - C) Integration of curriculum

4) Is the SER plan intellectually coherent?

Group 4

Small group 4 agreed to let the chairperson guide the proceedings of the group rather than to set ground rules. To begin work, each group member offered one idea that he or she felt was critical to the task. The members' ideas were:

Evaluative process must include feedback.
Experimentation. A need to experiment in the classroom. Reform is necessary.
Standard reform is here to stay. We must continue working on reform issues.
We must know what we are evaluating.
We are not here to talk about past years' initiatives. We must talk about reform today. What is happening.

Next, the group determined a need for a basic definition of systemic reform. The group considered SER in light of Smith & O'Day's (1991) criteria and their own notions of SER. The definition upon which the group settled was:

A process for improving student outcomes that:
- is guided by unifying vision and goals;
- entails
  - a coherent system of instructional guidance responsive to diverse student performance situations
  - a balanced top-down, bottom-up and middle-out governance process,
  - a process for ensuring public support for the changes,
  - an evaluation process that both documents and supports changes in student outcomes and the reform process; and
- involves all the stakeholders in the education system in a coherent and broad-based fashion.

The group members then engaged in a silent, individual brainstorming session, after which all members presented the questions they had created to the group. Each member (A-F) offered all of his or her questions:

A1) The robustness of the reform effort to ensure improvement when the reform is implemented differently than designer intended?
A2) What level or type of technology is required to support the reform? What is the value of reform if the technology is not there or changes?
A3) What is the nominal, not the ideal, period of time to implement and support the technology from debugging to, training, . . .?
A4) What range of customers, clients and contributors (teachers and students) are intended to benefit from the intended reform and how.?
B1) What support from the state/district is in place to sustain change for individual teachers?
B2) What are the parents' and students' responsibilities in the reform process?
C1) What has systemic reform done (what are the activities)?
C2) What are the impacts of those activities?
C3) What are the implication for different audiences?
C4) Are the goals clear? What are the key barriers and how are they being addressed? How do we know these standards are correct?
D1) Is the public convinced that schools have improved since systemic reform began?

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D2) Are students achieving better performances on assessments that embody the curriculum reform goals, objectives?
D3) Are the achievement gaps between groups being narrowed?
D4) Are young people adequately prepared for the next level of education or for productive/fulfilling employment?
E1) As a result of this systemic reform: What improvements have their been in student performance?
E2) What incentives are in place to encourage and reward each group of players (students, teachers, principals, superintendents, mathematics coordinators, politicians, test providers, professors, school members, parents) for making progress? Basically, why should they change?
E3) What feedback mechanisms and tools are in place to enable each group of players or each group member to monitor their own continuing progress or lack of it?
E4) Can these mechanisms provide ongoing summative information about the progress of the reform? If not, what does?
F1) Within any given learning environment, can improvement in student learning experiences within a semester (or whatever time period) be documented in such a manner that the stakeholders (teachers, students, principals) understand the value of the improvement?

The group considered several ways to proceed once the initial questions were proposed—by criteria for questions, by evaluation design, by categorization of questions, by comparison to the group's definition of SER, or by application to a particular example of SER. Members decided to examine the questions in light of the extent to which they would provide a measurement of the existence of SER and of the worth of the reform and evaluation efforts. The group divided into smaller groups in order to do so. Once the group had rejoined, the smaller groups reported their progress and clarified some questions.

Finally, the group determined to identify from its list of questions a set of "root" questions or meta-questions in a few primary categories. Group members used the large flip charts provided to discuss the questions, especially in terms of the merits and meanings of particular uses of language in each question. Of special importance to the group was the identification of tools for SER and its evaluation. The final set of questions for the group was:

1) Are students adequately prepared for the next level of education, for productive/fulfilling employment and for personal and community responsibilities?
   A) What are the levels of student performance on assessments that embody the reform goals and objectives?
   B) Are achievement gaps as measured among population groups being narrowed?
   C) Does the systemic reform curriculum develop students' capabilities as an individual and citizen?
   D) Do people actually use what they learned in school in their daily lives?

2) Is somebody developing a robust collection of tools for assessment, instruction, evaluation, public relations, professional development, recovery and resources that can be used effectively for systemic reform at every level?
   A) Are the tools widely available?
   B) How far and how well are the tools being used?
   C) Does use of the tools affect performance?

3) Do the key players reconsider the system and the system's performance in light of its continuously emerging goals?
   A) Is there momentum, continuing self-improvement?
   B) Is it a learning organization?

4) How far is the reform truly "systemic"?
   A) How well does systemic reform respond and adapt to its context?
   B) What progress is being made on such intermediate objectives as creating effective systems for professional development, teacher preparation, assessment of student learning, etc.?

Next Steps

In the closing session, members of the conference were given an opportunity to offer suggestions of what the next steps should be in building on what was discussed and produced by the conference. One of the authors of a discussion paper recommended that more specific questions be added forming a tree structure with broad branch questions and smaller twig questions leading from these. Another person supported using the questions generated at the conference to think about an evaluation design. Developing potential designs along with thinking experiments about how the design would be carried out was recommended. The designing process would have to consider cost, who should keep the data, feasibility, and other factors. This kind of effort could lead to a natural experiment in a school district. One person emphasized the need to think about an evaluation system that included different components and different levels of outcomes including intermediate outcomes.

Other suggestions centered on how the questions could be explored further. One person suggested that the identified questions be used to analyze the case studies that have been produced on the state systemic initiatives. Another person noted that methods for answering the questions should be considered and defined. The severity of the data problem in evaluating systemic reform was strongly noted by a number of people. A general question was raised about how systemic reform would change what students look like?

Members of the conference were asked to reflect on the questions that the four groups had generated and comment on what was missing. Only a few omissions were noted. One was that there were no questions about the change in the interaction among the different components of education. A second area that seemed to be missing was anything related to high-end testing such as what is done for college admissions.

Reference

Smith, M. S., & O'Day, J. A. (1991). Systemic school reform. In S. H. Fuhrman & B. Malen (Eds.), The politics of curriculum and testing (1990 Yearbook of the Politics of Educational Association, pp. 233-267). London: Taylor & Francis.

(webb/meeting.rpt)

Appendices

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Alba Thompson
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Bob Wood
Office of the Governor of Wisconsin

Appendix C: Meeting Agenda

Agenda
Evaluation Question Conference
National Institute for Science Education
Evaluation Strategies Team
January 4 and 5, 1996
Wisconsin Center for Education Research, Room 259
1025 W. Johnson Street
Madison, Wisconsin 53706

Meeting Aims:

1. Identify critical questions to ask for and about evaluation of systemic educational reform efforts; of whom should the questions be asked?
2. Identify the questions that will help determine the merit and worth of suggested educational reforms.
3. Determine which questions are most important.

Thursday, January 4, 1996

8:00-8:30 a.m. Breakfast

8:30-9:00 a.m. Plenary Session I
Setting the stage for evaluation of systemic reform
Aims of this meeting
Norman Webb, Team Leader, Evaluation Strategies Team

9:00-9:30 a.m. Overview of Agenda

Introductions and individual responses to this question, "What do you personally hope to get out of the next two days?"
Kathleen Paris, Office of Quality Improvement, UW-Madison

9:30-10:30 a.m. Overview of discussion papers
Writers each have 10 minutes to highlight the key questions they believe should be posed in evaluating a systemic educational reform effort and why each key question is important. Five minutes for questions will be allotted after each presentation.

Hugh Burkhardt	***Mathematics Student Outcomes***
Jim Ridgway	***System Alignment and System Change***
Andrew Jackman	***Community Colleges***
Kathy Comfort	***Science Student Outcomes***

Change to small groups

10:30-10:45 a.m.	Break
10:45-12:00 p.m.	Small group work (See instructions to small groups)
12:00-12:45 p.m.	Lunch
12:45-2:45 p.m.	Continue group work
2:45-3:00 p.m.	Break
3:00-3:45 p.m.	Complete small group work and prepare to report out
3:45-4:30 p.m.	Plenary session II Sharing of results from each group, including issues
4:30 p.m	End of Day One
5:45 p.m.	Pick up to Reception (lobby, Howard Johnson)
6:00 p.m.	Reception at Norman Webb's house--3913 Priscilla Lane, 238-0644
7:30 p.m.	Transport to dinner (on your own)

Friday, January 5, 1996

8:00-8:30 a.m.	Continental Breakfast
8:30-10:00 a.m.	Plenary Session III: Did your group enhance or modify the criteria for good questions? Discussion and critique of questions developed in small groups To what extent does each meet the criteria for good questions?
10:00-10:15 a.m.	Break
10:15-12:00 a.m.	Complete discussion and critique of questions developed in small groups Return to small groups to refine questions based on discussion and to add additional questions
12:00-12:45 p.m.	Lunch
12:45-2:15 p.m.	Continue small group work and post revised questions on walls
2:15-2:30 p.m.	Break
2:30-2:45 p.m.	"Gallery walk" to read revised questions (write any comments, compliments, suggestions at the bottom of the sheet)

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2:45-4:00 p.m.	Plenary Session IV: Discussion of next steps Meeting evaluation
4:00 p.m.	Adjournment

Appendix D: Small Group Assignments

Evaluation Questions Conference

Group One: Room 253, West Tom Romberg* Dan Heck Andrew Jackman Gretchen Kalonji Nanda Kirkpatrick Vanessa Wesbrook Facilitator: Kathleen Paris, Office of Quality Improvement, UW-Madison	Group Two: Room 253, Central John Wright* Charles Bruckerhoff Sam Butscher Tom Carpenter Denice Denton Sharon Hart Facilitator: Jessica Simmons, Office of Quality Improvement, UW-Madison
Group Three: Room 259 Vicki Bier Chris Anderson Sharon Derry Joan Grampp Andy Porter Jim Ridgway* Facilitator: John Elliott, Office of Quality Improvement, UW-Madison	Group Four: Room 253, East Susan Millar* Hugh Burkhardt Barrett Caldwell Rosann Hollinger Senta Raizen John Witte Andrew Zucker Facilitator: Char Tortorice, Assoc. Director, Testing and Evaluation Services, UW-Madison

*Group Leader

Appendix E: Criteria for Questions

January 4 and 5, 1996

Many of the Questions-Answer Propositions will

1. produce information about the value-added to the system because of the reform (comparative or contingent rather than only descriptive);

2. indicate or imply a time frame, level, population, and audience;

3. address the interrelationship among multiple of variables including allocation of resources, opportunity, and costs;

4. address properties that are sustained and institutionalized;

5. be of sufficient scale to span the full system;

6. support the integrity of content areas and researched knowledge-base;

7. attend to equity; and

8. be reliably answered, reasonable, and cost effective.

Appendix F: Meeting Evaluation Responses

1. What went well?

Everything! The explanations, the small group work, the food/lodgings.

The conference itself was benefitting especially with the state work I am currently involved in that works directly with a SSI. The people were very knowledgeable in their perspective fields.

Mix of folks from different backgrounds. Lacking colleagues from industry. They do lots of eval. Refinement of questions. Small groups were a bit too small. Perhaps b/c NSF wasn't represented.

Everything.

Small group sessions. Large group discussions.

Stimulating and interesting discussions about questions. Very well conceived and implemented. Support staff were very skilled at providing service such as coffee, etc. and facilitating discussions. The opportunity to apply for a fellowship is greatly appreciated.

Most things in process. Lots of good conversations. Well-defined brief (though difficult task). Excellent hospitality.

The preparation for the conference, communication of information prior to the conference. The opportunity as well as the safe environment for healthy and productive dialogue. Small group work was very productive. Opportunity to rethink and refine our work was great. The process must continue. Your goals and expectations of the group were meaningful and realistic.

I liked having papers to preview—to focus my thinking somewhat before arriving. The small group interaction was wonderful. Although I suspect that members would disagree on details, it was a good exercise to determine the common ideas among a diverse group. The one-on-one interactions were excellent—so many interesting people to meet and talk to!

Combination of people with varying backgrounds, small group split (not always pleasant, but easier and more participation than full group)

The group did a good job of fulfilling the request made of it. The convergence of the small groups and their commentary was useful.

Small group sessions—especially use of facilitators—particularly helpful with interdisciplinary group involved.

Focus on questions.
All small groups working in parallel on basically the same task/and chances for cross-fertilization.

Everything. (Were groups randomly selected or did you use Briggs Meyers? Ha!) Extremely stimulating. The diversity of the group was outstanding. Jim and Hugh were welcome additions.

Really appreciated the opportunity to network with such an elite group of educators! The grad students did a superb job at recording our proceedings, serving as small group facilitators and even providing input during the small group work. Food and snacks were great!

2. What could be improved?

I was frustrated with this process. There seemed to be a long drawn-out soul-searching about semantics, definitions and questions. I would have been much happier with a more targeted, less meandering discussion (focused on HOW we can answer a few key questions, rather than a comprehensive listing of all questions that should perhaps be asked.

Nothing comes to mind.

The number of classroom teachers and others directly associated with K-12 education (not to say that the collection of minds were not valued). My idea of an education conference would be to have an equal number of educators from the areas of K-5, 6-12, jr. college, four-year institutions and national agencies come together and discuss systemic reform and its definition separately, together and mixed small groups.

1) might have been useful to shift the composition of the small groups the second day, 2) it would be better if facilitators were grounded in the substance of discussions, 3) decrease introductory time and presentation of papers that were sent out ahead of time.

Perhaps draw out more critical opinion from the content specialists in science, math, engineering, and technology, or what they expect in the evaluation and the effects of SER.

Get materials out sooner for pre-reading. Have conference participants communicate in advance on an email list-serve to ascertain common interests. This could help to form groups based on expertise and interest.

Productivity very provisional. Ok? No mechanism to get balance/coverage. Professional facilitations and skilled chair is open question in my mind. Later probably get further faster.

There was a large group of "university folk" attending this conference. Would have appreciated a greater mix of two year and K-12 educators. The Friday afternoon session did not seem to be well focused and felt too much time was spent in philosophical discussions!

Maybe mix the groups. So Day 2 could have different folks meeting (ok, progress would be slower, but networking up). Note takers who are experienced in the substantive area.

We should begin to bring in people from other disciplines such as social studies and language arts and work with science and math teachers.

Better pre-briefing of participants. Many participants came to talk about "systemic reform" itself or even detailed changes in curriculum or technique rather than about the EVALUATION of SR effectiveness.

Introductions were too long, too routine for a non-routine meeting. Similar comment on discussion paper presentations. These two components of agenda consumed a great deal of time that could have been better spent in group work.

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Better definition of what will happen with products of this conference. I just hope that this was not just an intellectual exercise. I would have liked for us to distill the four lists of questions into a single, comprehensive list.

Less domination by educational policy "expert" researchers. Perhaps give groups different tasks (self-selected or assigned) and/or more autonomy in defining scope.

My group was not as balanced as others (reviews/approaches) due to absences, so some views dominated...free flow of perceptions inhibited.

Clarify the task...there were too many versions, iterations and attachments (e.g., the criteria), plus too many rules (e.g., how the group should act..page of "rules"). Set out the task, discuss it, and let the groups go to work.

3. Can you think of any additional information/activities that could add value to this event?

Give participants a bibliography of evaluation documents. (You still might.)

Intro/more social event opportunity early on. Have everyone write a one-page summary of goals, needs, "where they are" before arrival (focused on a specific topic?)

Distribution of a product to the participants. It would also be interesting to get a summary of the analysis of collaborative efforts and small group interaction.

Network information, either by mail, fax, or email.

A little more time for one-on-one networking, but you needed every minute!

More readings prior to the conference would have been helpful. Thank you for inviting me to participate!
More informal talk

Work on some "real" examples of SER to see how one could pursue the questions.

A concrete example or two for next time?

A few articles from the existing lit to provide context.

Send us copies of the final report!

No—sorry!

Appendix G: Pre-Conference Discussion Papers

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

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